Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of the Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	ET Docket No. 95-183 RM-8553
Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	PP Docket No. 93-253

COMMENTS OF WINSTAR COMMUNICATIONS, LLC

Winstar Communications, LLC

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December 3, 2004

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of the Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands	)	ET Docket No. 95-183 RM-8553
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COMMENTS OF WINSTAR COMMUNICATIONS, LLC

On behalf of Winstar Communications, LLC, an IDT company (hereinafter "Winstar-IDT"), enclosed please find its comments in response to the Third Notice of Proposed Rulemaking regarding Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands.[1]

I. Introduction

Winstar-IDT, ultimately owned by IDT Corp. (NYSE: IDT and IDT.C), provides terrestrial based, predominately fixed, broadband communications using the area-wide licensed 38.6-40.0 GHz ("39 GHz") and Local Multi-Point Distribution Service ("LMDS" or "28 and 31 GHz") bands**.** The Winstar-IDT area-wide licenses cover the entire country (Alaska, Hawaii and the lower 48 states) and Puerto Rico. Winstar-IDT also utilizes the point-to-point licensed microwave bands (including, but not limited to 18 GHz, 23 GHz, etc.). Winstar-IDT engages in spectrum leasing in accordance with the Secondary Spectrum Market process implemented this year.

[1] Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands; Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands, *Notice of Proposed Rulemaking*, ET Docket No. 95-183, RM-8553, PP Docket No. 93-253, (Adopted March 31, 2004) (hereinafter "NPRM").

In this Third Notice of Proposed Rulemaking the Commission proposes to adopt a conforming set of rules for the 37.0-38.6 GHz band ("37 GHz") and the 42.0-42.5 GHz ("42 GHz") band that would substantially conform to the rules already adopted for the 38.6-40.0 GHz ("39 GHz") band. The Commission states that conditions have changed considerably and that it is willing to consider alternatives if commenters can demonstrate that a different regulatory framework would be more appropriate.[2]

II. Comments

A. Exclusive Geographic Area Licensing Makes Economic and Technical Sense

Winstar-IDT supports licensing on an exclusive use, geographic area, basis using Economic Areas, consistent with the licensing scheme adopted for the 39 GHz band.[3]

Winstar-IDT believes that using the first-come first-served link registration approach[4] in this band stifles both effective competition and innovation. The plan adopted for the 70/80/90 GHz bands (multiple non-exclusive nationwide licenses[5]) fails to fit the physics and economics relevant to the 37 GHz band. Multiple licensees in close proximity in the 37 GHz band, where wider beamwidths and multipoint applications exist, raise real and immediate coordination and interference concerns, and reduce the likelihood of investment and deployment. It also dampens the incentives for, and practicality of, deploying ultra broadband and cognitive systems across both the 39 GHz and 37 GHz bands.

B. Establish Technical Rules Flexible Enough to Support Point-to-Point/Point-to-Multipoint/Mobile

Winstar-IDT supports the proposal to permit point-to-point ("PTP"), point-to-multipoint ("multipoint") and future mobile operations in the 37 GHz band.[6] The FCC already adopted rules allowing PTP and multipoint in the 39 GHz band and it agreed to allow mobile

[2] *See id*. at para. 1.
[3] *See id*. at para 28.
[4] *See id*.
[5] *See generally,* Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands; Loea Communications Corporation Petition for Rulemaking, *Report and Order,* 18 FCC Rcd. 23318, (2003).
[6] *See* NPRM at paras. 29-30.

applications, subject to a rulemaking to develop the necessary technical rules.[7] Geographic area license holders that purchased their license through an auction or other commercial acquisition process should enjoy the right to establish "private commons" in accordance with the Spectrum Secondary Market rules.[8] The Commission is encouraged to permit mobile operation in these bands with a minimum of regulatory constraints. These regulatory constraints should be limited to geographic and adjacent channel interference concerns between licensed areas. The spectrum reaches its highest usefulness if the Commission resolves these issues prior to engaging in licensing.

C. Licensing Renewal

The Commission proposes to adopt a "substantial service" build-out requirement for licensing renewal, if the band is licensed using EAs, but invites comment on alternative build-out requirements if a different licensing scheme is adopted.[9] As Winstar-IDT has stated in past proceedings[10] we support licensing on an EA basis, but we do not agree with the requirement that licensees demonstrate substantial service on a per-license, per-channel basis. The Commission should take into account *all* common costs that licensees incur in building national or regional networks when considering whether a licensee has met its substantial service requirement.[11] As the Commission is well aware, these costs cannot be rationally allocated to one particular license or another. Rather, they are costs incurred to build out all the licenses held by a licensee. This approach is consistent with the flexibility intended by the 39 GHz Order and stated as intended in this order. Such consideration will provide certainty to these licensees that their common investments will be considered – as they should be – by the Commission. As a result, Part 101 licensees will continue to make region-wide and nationwide network investments with the assurance that those investments will be counted toward the development of their

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[7] *See* Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, *Report and Order and Second Notice of Proposed Rule Making*, 12 FCC Rcd. 18600, at paras. 23-25 (1997).

[8] *See generally* Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets, *Second Report and Order, Order on Reconsideration and Second Further Notice of Proposed Rulemakin*g, 19 FCC Rcd. 17503 (2004).

[9] *See id*. at para. 38.

[10] *See generally* Comments of Winstar Comm., LLC, 2002 Biennial Review, FCC 02-310 (Oct. 18, 2002) (See Attachment A).

[11] The common costs include designing and engineering the network, constructing operations support systems, building databases to provide technical support to the network and customers, obtaining wireline capacity to interconnect wireless service areas, entering into equipment contracts, attaining building access rights, marketing, and general administrative functions.

licenses. Rules that closely track Section 101.1011 "Construction requirements and criteria for renewal expectancy"[12] for the LMDS service would remove the directly contradictory regulations governing fixed wireless license management and build-out requirements that currently exist in Section 101.17.[13]

D. Aggregation/Disaggregation

Winstar-IDT supports the Commission's proposal to permit licensees to partition and/or disaggregate either through the competitive bidding process or through private negotiation and agreement.[14] The decision should be at the discretion of the bidding consortia or license holder and should of course be subject to all coordination rules.

E. Bandplan

As Winstar-IDT previously recommended to the Commission, we support the bandplan proposal for 50 MHz paired channels with 700 MHz separation between the transmit and receive frequencies, and with four 50 MHz unpaired channels.[15] However, as we also previously recommended we have an alternative proposal for placement of the unpaired channels.[16] Having the four unpaired channels contiguous, either below or above the paired channels, limits their usefulness. We believe that the four contiguous channels could then only be used individually for resolving interference problems. It would not be possible to pair them or concatenate them in any way, because there would be virtually no separation between go and return channels. This may lead to spectrum inefficiency. A more useful method would be to split the unpaired channels into two banks, one at the upper end of the spectrum and the other at the lower end of the spectrum with sufficient separation for go/return pairing on a case by case basis.

F. Resolve Satellite Interference Concerns Prior to Licensing the Spectrum

Any satellite downlinks and Earth station deployments operating in the 37.5-40.0 GHz band raise serious issues that require resolution prior to the FCC adopting any licensing scheme.

[12] *See* 47 C.F.R. § 101.1011 (2003).
[13] *See* 47 C.F.R. § 101.17 (2003).
[14] *See* NPRM at para. 48.
[15] Letter from Winstar Comm, LLC to Messrs James Ball, International Bureau, Federal Communications Commission and Ronald Netro, Wireless Telecommunications Bureau, Federal Communications Commission (Aug. 7, 2003) (See Attachment B).

If earth stations become authorized to operate in the band the pfd coordination trigger proposed in the NPRM must replace the distance coordination trigger.[17] Any decision to deploy terrestrial equipment or investment in the band must be predicated upon (i) uniform terrestrial coordination parameters and (ii) insuring that earth station licensees possess secondary rights to terrestrial stations. Fixed Satellite Service ("FSS") licensees must obtain a coordination agreement with all potentially affected Part 101 licensees prior to filing an application for a Part 25 license in that band. Regarding the FSS, the Commission should limit the 37 GHz FSS deployment to only gateway earth stations. Require (i) the corresponding satellite beams to avoid non-rural FS deployment areas or (ii) require the satellite provider to purchase all the corresponding terrestrial licenses impacted by the satellite beam.

G. Adopt the Proper Satellite Downlink pfd Levels

Prior to establishing an auction or any other process for terrestrial licensing in the 37 GHz band, satellite downlink pfd levels to the satellite Earth stations (under both clear sky and rain fade conditions) require adjustment. Winstar-IDT recalls the U.S. proposals to both the CITEL meeting leading up to WRC 2000 and to WRC 2000 provided the proper protection. (See Attachment C.) It is this level of protection, originally agreed by all U.S. participants and proposed by the U.S. to the March 2000, CITEL PCC III meeting that is necessary to permit unencumbered operation, without the potential for unacceptable interference to our customers and to other terrestrial licensees in clear sky conditions. Attachment C shows: (i) the protection requirements for the fixed service agreed to by U.S. participants and proposed by the U.S. to the CITEL meeting; (ii) the reduction in protection resulting from outside pressure from other countries at that CITEL meeting; and (iii) the further reduction in protection resulting from international pressure at WRC 2000. The NPRM addresses technical standard and licensing issues within the U.S. borders. Adopt the attached engineering standards the U.S. government and U.S. telecommunications community prepared and proposed to CITEL since those standards represent the true engineering criteria best suited for the 37 GHz terrestrial spectrum.

Great concerns also exist regarding the pfd levels that might be encountered when the satellite operates automatic transmit power control (ATPC) to overcome rain induced fading to

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[16] *See id*.
[17] *See id*. at para. 77.

its Earth station receiver, in the 37.5-40.0 GHz band. The Commission has been party to the many meetings, discussions, comments, reply comments and study presentations concerning the issue of "differential attenuation" when the FSS operator raises its power, using ATPC. As a result of many liaisons between ITU-R working parties, guidance has been received from the ITU-R propagation experts in study group 3, as how to calculate the differential attenuation using both yearly and worst month statistics. Winstar-IDT has used that guidance to develop computer models of the excessive interference that would be received by fixed service receivers within the FSS spot beam at different levels of ATPC. The results are attached. (See Attachment D). These results show the unacceptable increase in affected fixed service stations at the various levels. This shows that the concern raised by Winstar-IDT regarding how much, for how long and how often the FSS operator may increase transmit power is based upon valid anticipation of unacceptable interference. Winstar-IDT strongly urges the Commission to (i) not permit use of ATPC or (ii) to permit it only in such a manner that it will not cause increased interference into 37 GHz terrestrial licensees. Winstar-IDT has previously recommended that these Earth stations only be permitted in dry climates and far removed from major metropolitan areas.

Winstar-IDT is also concerned about the potential for interference into the Earth Stations from terrestrial service transmitters. We have analyzed the separation requirements between a terrestrial service station located in an urban environment and nearby FSS Earth stations at 37-39 GHz that would allow both types of stations to co-exist with minimal coordination requirements. The analysis in Attachment E addresses the separation requirements needed in order to protect FSS Earth Stations from terrestrial stations at 37-39 GHz. In order to avoid coordination difficulties it is recommended that the satellite providers acquire the terrestrial license in the area they seek to operate, and failing that, perhaps gateway earth stations be located at least 60 km from the high density fixed station communities. As can be seen, though the potential for interference into the Earth station does require some degree of separation the potential for interference into the fixed service receiver from the space station requires an even greater separation distance between an earth station and a FS receiver.

H. Coordination with Federal Government

The Commission seeks comment on the appropriate coordination method to employ between adjacent licensees and with the Federal government and proposes to apply these changes to the 39 GHz band as well as the 37/42 GHz bands.[18]

Winstar-IDT does not believe that the coordination requirements or the coordination methods employed between geographic area licensees and Federal government operations should be any different than the requirements and methods used between non-Federal government operations. Commercial operators, like Winstar-IDT, often support Federal government systems. Geographic area licensees acquired their rights through a competitive bidding process and should be protected to the same degree from all other operators. This also means that there should be no more constraint on the non-Federal government licensee to protect Federal government operations as to protect non-Federal government operations. Winstar-IDT of course recognizes that in a limited number of specific circumstances, National Security interests might need to be given priority to this expectation of protection.

III. Conclusion

The economic and engineering value in the 37 GHz band remains constrained. The band requires carefully considered technical rules to unlock the value in the asset. Winstar-IDT supports licensing the 37 GHz band in a manner consistent with the licensing rules in the 39 GHz band; i.e., geographic area licensing resulting from competitive bidding. Substantial service licensing renewal requirements for both the 37 and 39 GHz bands should be based upon the licensee's entire network, not on a per channel basis. Winstar-IDT remains concerned about the FSS downlink pfd levels permitted under clear sky conditions and the additional interference that would occur should the FSS operators increase their power level to overcome rain induced fading and thus recommends the pfd levels articulated in Section G. Finally, since commercial operators often service Federal government agencies and because the physics of 37 GHz propagation remain the same whether equipment is being used for Federal or non-Federal applications, Winstar-IDT does not believe that the coordination requirements or the

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[18] *See id*. at para. 92.

coordination methods employed between geographic area licensees and Federal government operations should be any different than the requirements and methods used between non-Federal government operations.

Respectfully submitted,

Winstar Communications, LLC

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December 3, 2004

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ATTACHMENT A

Before the
Federal Communications Commission
Washington, D.C.

In the Matter of	)	
	)	
Biennial Review 2002 Comments	)	WTB Docket No. 02-310
	)	
	)	

COMMENTS OF WINSTAR COMMUNICATIONS, LLC

On behalf of Winstar Communications, LLC [19] (hereinafter "Winstar") enclosed herewith please find its comments regarding the 2002 biennial review of telecommunications regulations within the purview of the Wireless Telecommunications Bureau.[20]

I. INTRODUCTION

In the Public Notice the Commission notes that "[p]ursuant to Section 1.430 of the Commission's rules, 47 C.F.R. § 1.430, we seek suggestions from the public as to what rules should be modified or repealed as part of the 2002 biennial review. The Commission also encourages parties to comment on or recommend changes to rules that might enable the Commission to operate more efficiently and effectively."[21]

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[19] Most of the assets of Winstar Communications, Inc. ("Old Winstar") were purchased out of Chapter 11 bankruptcy on December 19, 2001 by a wholly-owned subsidiary of IDT Corp. ("New Winstar"), and New Winstar became involved in company operations pursuant to a contiguously created management agreement that was adopted by the bankruptcy court. The FCC granted the related assignment of the Old Winstar spectrum licenses in a series of actions on April 17, 2002. Some of those assignments were conditioned. Most of those license assignments were consummated June 14, 2002 except for the assignment of certain LMDS licenses, which remains to be concluded, subject to the performance of certain conditions.

[20] *See* The Commission Seeks Public Comment in the 2002 Biennial Review of Telecommunications Regulations within the Purview of the Wireless Telecommunications Bureau, *Public Notice*, (FCC 02-267) (Sept. 26, 2002).

[21] *See id*.

Winstar's comments address particularly Part 101-Fixed Microwave Services, Subpart B-Applications and Licenses, Section 101.17-Performance requirements for the 38.6-40.0 GHz frequency band. Winstar recommends that Section 101.17 be modified to remove directly contradictory regulations governing fixed wireless license management and buildout requirements. Such contradictory rules require modification, pursuant to the goals of this proceeding.

II. Comment

Winstar provides terrestrial-based, predominately fixed, broadband communications using the area-wide licensed 38.6-40.0 GHz ("39 GHz") and Local Multipoint Distribution Service ("LMDS" or "28 GHz and 31 GHz") bands. The Winstar area-wide licenses cover the entire country, Alaska, Hawaii and the lower 48 states. Winstar also utilizes the point-to-point licensed microwave bands (including, but not limited to, 6 GHz, 10 GHz, 18 GHz and 23 GHz).

According to the Commission's rules and precedent, the requirements to satisfy the "substantial service" standard exceed those necessary to qualify for license renewal. However, the Commission appears to turn the "substantial service" standard into the basis for license renewal for licensees in the 38.6-40.0 GHz band. Yet, in other contexts, the standard is defined as service that is substantially above a level of mediocre service, which might just minimally warrant renewal. The Commission has incorporated the term "substantial service" into the renewal process for 39 GHz licensees in a manner that differs from its original intended use. The application of this "more than minimally required for renewal" standard as the minimum standard for renewal of an uncontested license is irrational and indefensible as a matter of due process and administrative law.[22]

[22] *See* Trinity Broadcasting of Florida v. FCC, 211 F.3d 618, 628 (D.C. Cir. 2000) ("[W]e have repeatedly held that 'in the absence of notice -- for example, where the regulation is not sufficiently clear to warn a party about what is

The term “substantial service” has its origins in the broadcast industry. It was the determinative factor for licensees’ renewal expectancy, which served as a major preference and was the most important consideration in a comparative hearing. In 1992, the Commission adopted rules establishing renewal expectancies for cellular licensees. The rules provided that at the end of the license term, if a competing application was filed, an otherwise qualified cellular licensee would be granted a renewal expectancy if it could show that it was providing substantial service -- defined as service which is sound, favorable and substantially above a level of mediocre service which might just minimally warrant renewal.[23] If the licensee could not make a substantial service showing, the merits of its application would be compared with those of challengers in a comparative hearing. Even if a licensee was not providing substantial service, it could retain its license if it was judged comparatively superior. Thus, the term “substantial service” was used to determine whether a licensee should be awarded a renewal expectancy, not whether renewal was warranted.

In adopting the 39 GHz rules in 1997, the Commission, for the first time, explicitly combined the performance standards required at buildout with the requirements for a renewal expectancy into one showing of substantial service at the time of license renewal.[24] The

expected of it -- an agency may not deprive a party of property by imposing civil or criminal liability.’ We thus ask whether ‘by reviewing the regulations and other public statements by the agency, a regulated party acting in good faith *would be able to identify, with ascertainable certainty, the standards with which the agency expects parties to conform*.’”) (quoting General Elec. Co. v. EPA, 53 F.3d 1324, 1328-29 (D.C. Cir. 1995) (emphasis added); *see also* Satellite Broadcasting Co. v. FCC, 824 F.2d 1 (D.C. Cir. 1987) (finding that the Commission is not permitted to rely upon “baffling and inconsistent” rules to dismiss license applications).

[23] The Commission initially required that cellular radio licensees show that they had made “substantial use” of their spectrum to receive a renewal expectancy. *In re* Amendment of Part 22 of the Commission’s Rules Relating to License Renewals in the Domestic Public Cellular Radio Telecommunications Service, *Report and Order*, 7 FCC Rcd. 719, para. 9 (1992). However, on reconsideration, the Commission determined that the “substantial service” standard, derived from case law in the broadcast area, would be more easily understood. *In re* Amendment of Part 22 of the Commission’s Rules Relating to License Renewals in the Domestic Public Cellular Radio Telecommunications Service, *Memorandum Opinion and Order on Reconsideration*, 8 FCC Rcd. 2834, paras. 8-9 (1993).

[24] *In re* Amendment of the Commission’s Rules Regarding the 37.0-38.6 and 38.6-40.0 GHz Bands; Implementation of Section 309(j) of the Communications Act -- Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz, *Report*

Commission determined that specific construction requirements were not appropriate for fixed, geographically licensed wireless services, and adopted the substantial service standard to impose the least regulatory burden and allow licensees to tailor their showing to reflect the services they offer.[25] Notwithstanding this very positive conclusion, the Commission provided substantial service safe harbor examples based upon the construction of a fixed number of links per million population in each license area -- an example that could undermine the flexibility the Commission sought to promote if strictly adhered. In addition, the Commission concluded that failure to show substantial service would result in automatic licensee termination.[26] This effectively converted a renewal expectancy into an absolute renewal requirement.

Because the 39 GHz rules do not provide a relevant definition of "substantial service," licensees are entitled to refer to prior FCC interpretations of that term in similar contexts.[27] Substantial service, by its very definition in other FCC rules, requires something "substantially above" the showing that would minimally justify renewal. It is this "substantially above" concept that makes it proper for determining whether a licensee gets a renewal expectancy (creating a preference in favor of the licensee against challengers). However, pursuant to the current 39 GHz rules, licensees must prove that they are providing service that is "substantially

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and Order and Second Notice of Proposed Rulemaking, 12 FCC Rcd. 18600, para. 47 (1997) (hereinafter "39 GHz Order"). The Commission subsequently adopted rules for other Part 101 wireless services that similarly conflated the construction requirements, renewal expectancy and minimum renewal standard. *See In re* Rulemaking to Amend Parts 1, 2, 21 and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, To Reallocate the 29.5-30.0 GHz Frequency Band, To Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *Second Report and Order, Order on Reconsideration, and Fifth Notice of Proposed Rulemaking*, 12 FCC Rcd. 12545, para. 270 (1997) (hereinafter "LMDS"); *In re* Amendments to Parts 1, 2, 87 and 101 of the Commission's Rules to License Fixed Services at 24 GHz, *Report and Order*, 15 FCC Rcd. 16934, para. 38 (2000) (hereinafter "24 GHz Band"). However, the Part 101 service-specific rules do not apply these concepts uniformly, although the LMDS and 24 GHz rules were based upon the 39 GHz rules.

[25] Notably, the Commission recognized that "[t]he build-out requirements which applied to other fixed, microwave services licensed on a link-by-link basis . . . did not appear appropriate for a fixed, geographically licensed service like 39 GHz." 39 GHz Order para. 40.

[26] 47 C.F.R. § 101.17(b) (1999) ("Any 38.6-40.0 GHz band licensee adjudged not to be providing substantial service will not have their license renewed.").

above" that which would "minimally justify renewal" in order to qualify for renewal. This standard is confusing and inconsistent with the flexibility intended by the 39 GHz Order.

Another aspect of the renewal process for 39 GHz licensees which is confusing and inconsistent with the flexibility intended by the 39 GHz Order is the current rule requiring licensees to demonstrate on per-channel, per-license basis that substantial service is being provided.[28] Many of the costs incurred by companies to build out network are common costs; that is, they are costs that will benefit all the areas of the network. The common costs include designing and engineering the network, constructing operations support systems, building databases to provide technical support to the network and customers, obtaining wireline capacity to interconnect wireless service areas, entering into equipment contracts, attaining building access rights, marketing, and general administrative functions. As the Commission is well aware, these costs cannot be rationally allocated to one particular license or another. Rather, they are costs incurred to build out all the licenses held by a licensee.

III. CONCLUSION

Notwithstanding the requirement that licensees demonstrate substantial service on a per-license, per-channel basis, the Commission has stated that it will give 39 GHz licensees a "significant degree of flexibility" in meeting the service requirement.[29] In order to make good on this promise, the Commission must consider the common costs incurred by licensees such as

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[27] *See* Trinity Broadcasting of Florida v. FCC, 211 F.3d at 629 (D.C. Cir. 2000) ("[W]here . . . the agency failed to provide a relevant definition for the key regulatory term . . . the applicant is entitled to rely on the agency's prior interpretation of a nearly identical regulation.").

[28] 47 C.F.R. § 101.17(a). Interestingly, it is only in the final rule that the per-channel substantial service showing requirement appeared. The 39 GHz NPRM did not propose applying substantial service on a per-channel basis, and the 39 GHz Order is silent as to applying substantial service on a per-channel basis. Moreover, the Commission's rules do not impose a per-channel-showing requirement on other Part 101 licensee, such as LMDS licensees. *See id*. *at* § 101.1011 (2000).

[29] 39 GHz Order para. 42. The Commission also provided quantitative safeguards for licensees to use in meeting the substantial service test. While these safeguards are useful for some licensees, they should not prevent the Commission from relying on other demonstrative factors, such as those outlined above, in determining whether a licensee is providing substantial service.

Winstar to build a regional or national network in evaluating whether substantial service has been provided. The Commission should take into account all common costs that licensees incur in building national or regional networks when considering whether a licensee has met its substantial service requirement. This approach is consistent with the flexibility intended by the 39 GHz Order, and it will provide certainty to these licensees that their common investments will be considered -- as they should be -- by the Commission.[30] As a result, Part 101 licensees will continue to make region-wide and nationwide network investments with the assurance that those investments will be counted toward the development of their licenses.

Modification of Section 101.17 to closely track Section 101.1011-Construction requirements and criteria for renewal expectancy for the LMDS service would remove the directly contradictory regulations governing fixed wireless license management and buildout requirements.

[30] *See* Gregory L. Rosston & Jeffrey S. Steinberg, Using Market-Based Spectrum Policy to Promote the Public Interest, 50 FED. COMM. L.J. 87, 111 (1997) ("If spectrum users and their financial supporters are not reasonably certain of the rules that will govern spectrum use, they will be less willing to invest in obtaining and developing the spectrum.").

WHEREFORE THE PREMISES CONSIDERED, Winstar Communications, LLC requests that the Commission proceed expeditiously in its consideration of these proposals, and giving due consideration to the comments and recommendation made by Winstar in our Comments, as above.

Respectfully submitted,

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October 18, 2002

ATTACHMENT B

EX PARTE

August 7, 2003

Mr. James Ball – International Bureau, Policy Division
Mr. Ronald Netro –Wireless Telecommunications Bureau
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: In the Matter of Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations: IB Docket No. 97-95

Dear Messrs. Netro and Ball,

On March 11, 2003, representatives of Winstar Communications, LLC, an IDT Company, met with staff members of the International and Wireless Telecommunications Bureaus[31] regarding the Further Notice of Proposed Rulemaking (FNPRM) adopted on May 24, 2001, associated with IB Docket 97-95.

The FCC meeting attendees asked the Winstar representatives several questions regarding the Winstar network that we needed to discuss with our engineering department and with our Network Operations Center. We have consulted with both and hereby provide answers to the questions generated during the March 11 meeting.

I. Questions and Answers

1) What percentage of links deployed by Winstar in the 38.6-40.0 GHz band are at various path lengths?

Path Distance Range (mile)	%
0 to 0.15	16.96
0.15 to 0.25	14.08
0.25 to 0.5	28.60

[31] FCC attendees included Messrs., Jacobs, Locke, Netro, Pollak and Strickland. Attendees from Winstar included Gene Rappoport, Vishnu Sahay, Joseph M. Sandri, Jr. and Lynne Hewitt Engledow.

0.5 to 0.75	15.59
0.75 to 1.00	10.13
1.00 to 1.25	5.69
1.25 to 1.5	2.75
1.5 to 2	2.94
2 to 3	1.98
3 to 5	1.02
> 5	0.26
Total	100

2) Is there any correlation between path length and elevation angle?

Typically, a correlation exists. Generally, the shorter the path the higher the chance of steep elevation angles. However, building elevation data currently available in our database is not sufficient to produce the statistics that will reflect a characterization of the entire network.

3) Does Winstar use power control to overcome fading? If so, what is the form of power control?

We currently do not have our links equipped with automatic power control in the 39 GHz band.

4) What is Winstar's view on the FCC's channel plan proposal for the 37.0-38.6 GHz band?

The current proposal is for 14 paired 50 MHz channels with 4 unpaired channels in the top 200 MHz. Doesn't it make more sense if the unpaired channels are at the bottom rather than at the top of the band?

We suggest that to the extent possible, the paired channels should have the same 700 MHz transmit/return separation as in the already planned band. This would facilitate equipment design and system implementation for expansion of existing links. Having the four unpaired channels contiguous, either below or above the paired channels, limits their usefulness. We believe that four contiguous channels could then only be used individually for resolving interference problems. It would not be possible to pair them or concatenate them in any way, because there would be virtually no separation between go and return channels. This may lead to spectrum inefficiency. A more useful method would be to split the unpaired channels into two banks, one at the upper end of the spectrum and the other at the lower end of the spectrum with sufficient separation for go/return pairing on a case-by-case basis.

5) What is Winstar's current fade margin? What will Winstar's future fade margins need to be?

Reducing RF power output to the point that the far end has a 5-10 dB receive level above threshold (fade margin) is currently ideal (but that may change over time) for spectrum conservation and frequency reuse in this band, but, without ATPC, performance degradation risk increases unacceptably as distance increases. Current radio receivers will deliver error-free performance if presented with a signal in this range and absent any spurious signals. Maintaining network performance meeting an annual target of 99.999% with a fixed power output radio limits the effective range at which we can operate. As an example, in the D2 Rain Region (as defined by Robert K. Crane) using P-COM DS3 radio equipment, attenuating the RF output so that the far end receives –61dBm (8dB above its' threshold of –69dBm) will operate up to a maximum distance of 0.2 miles and meet 99.999% availability. As can be seen in the table responding to question #1, approximately 30% of our links are within the .2 mile range and can be provided with a fade margin of 10 dB or less, while maintaining 99.999% availability. As distance increases fade margin must also increase in order to maintain our required level of service. No plans exist at this time to implement ATPC on our links. We hope that future RF developments result in affordable, widely available equipment that allows for increased distances with lower required input power into the antenna, thereby improving frequency re-use, without reducing our performance objectives. We possess no timeline or certainty about those developments.

II. Conclusion

Winstar requests that the Commission carefully consider the potential effect of FSS power increases, within the total spot beam area on FS stations where uncorrelated fading between the FSS Earth Station and FS receiver locations causes an unacceptable increase in interference to the FS receivers. With continuing FS growth in the band coupled with the imminent release of the Secondary Markets Order we anticipate a surge in terrestrial 39GHz deployments requiring protection.[32] Additionally, Winstar asks the FCC to consider the possibilities for deployment of gateway stations in the band 38.6-40.0 GHz in a manner to eliminate any service quality deterioration to the Fixed Service, including a requirement that the FCC operator attain a commercial agreement with the existing terrestrial licensee and a requirement that the FSS operators utilize geographically diverse redundant gateways, and other methods, in order to remove the need for FSS Systems to increase power to harmful levels.[33]

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[32] *See FCC Adopts Spectrum Leasing Rules and Streamlined Processing for License Transfer and Assignment Applications, and Proposes Further Steps to Increase Access to Spectrum Through Secondary Markets*, FCC 03-113 News, May 15, 2003.

[33] Please refer to the prior letter sent from Winstar Communications, LLC regarding this proceeding. In particular, please note the following portions of the cited letter.

> "Winstar agrees with the Commission that FSS gateway Earth stations require deployment in a manner that minimizes their effect, including during fade conditions, to the High Density Fixed Service, in the band 38.6-40.0 GHz. The most desirable deployment methods include using geographic diversity in gateway Earth station locations to minimize using automatic transmit power control to overcome fade conditions caused by rain attenuation. Another deployment option siting the gateway stations in dry climate areas to again minimize fade condition occurrence and duration, thus removing or decreasing the need to increase power. A third option includes siting the gateway stations in unpopulated or sparsely populated areas, thus reducing spot beam overlap into a HDFS service area.

If you have any remaining or additional questions please contact Gene Rappoport at (202) 367-7603 / grappoport@winstar.com or Joe Sandri at (202) 367-7600 / jsandri@winstar.com.

Very Truly Yours,

Joseph M. Sandri, Jr.
Winstar Communications, LLC
SVP, Regulatory Counsel

cc: Edward Jacobs
Paul Locke
Mike Pollak
David Strickland

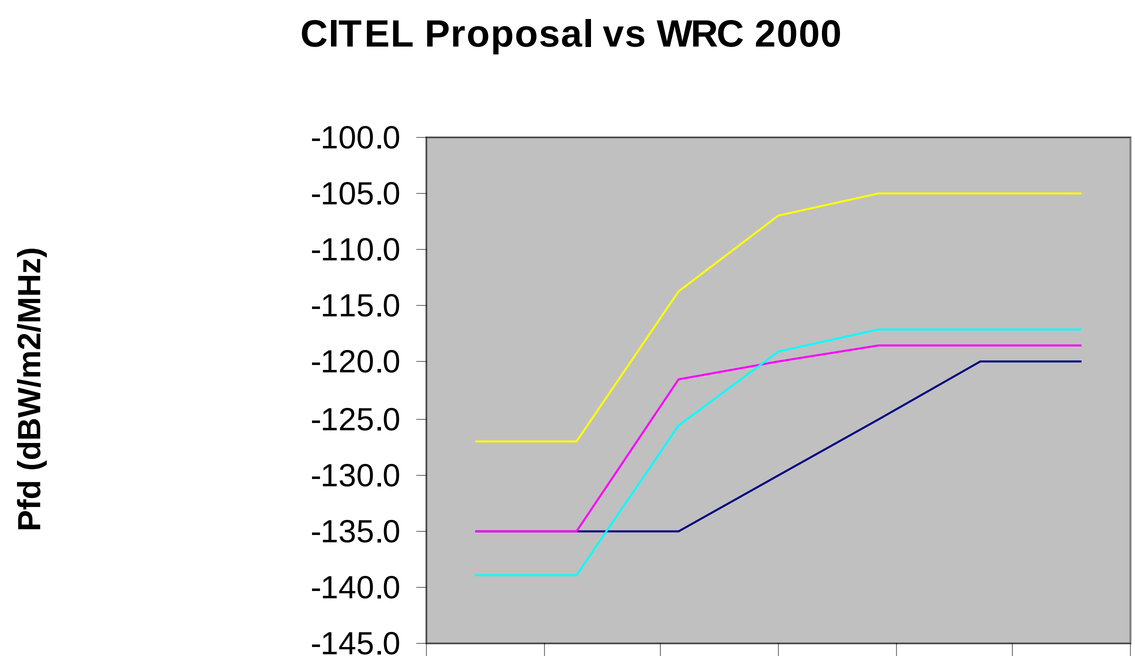
The Commission may also wish to consider the use of coding related fade compensation methods. These methods are discussed in annex 2 of the ITU-R working document towards a draft new recommendation (4-9/S/DFC-40 GHz). (See attachment 3.) In this approach an adjustable data rate strategy is adopted whereby either the coding, the modulation or both would be adjusted to provide the necessary performance in the event of varying rain rates, without increasing the power level.

Winstar requests that the Commission carefully consider the potential effect of FSS power increases, within the total spot beam area on the high density FS stations within the spot beam and outside the faded area. Additionally, Winstar asks the FCC to consider the possibilities for siting gateway stations in the band 38.6-40.0 GHz in a manner to minimize the effect on the Fixed Service."

Letter from Joseph M. Sandri, Jr. SVP & Regulatory Counsel, Winstar Communications, LLC to Messrs. Ronald Repasi and Ronald Netro, Federal Communications Commission (March 4, 2003) (in the IB Docket No. 97-95).

ATTACHMENT C

**PROPOSED PFD LEVELS TO
PROTECT HIGH DENSITY FIXED SERVICE**



	0.0	5.0	15.0	25.0	30.0	90.0
USA to CITEL 03/00	-135.0	-135.0	-135.0	-125.0	-120.0	-120.0
CITEL TO WRC 2000	-135.0	-135.0	-121.5	-118.5	-118.5	-118.5
WRC2000: S21-4	-127.0	-127.0	-113.7	-105.0	-105.0	-105.0
S21-4 minus 12 dB	-139.0	-139.0	-125.7	-117.0	-117.0	-117.0

Angle of Arrival (deg)

ATTACHMENT D

Impact of Downlink Power Control on FS Stations Taking into Account Differential Fading

1. Introduction

Based upon methodology provided by ITU-R Working Party 3M it is now possible to estimate, on a global basis, the effect of rain fade differentials on the satellite to earth station and the satellite to FS paths under the scenario where the satellite uses downlink power control. Based upon this information, it is possible to determine the probability of stations which otherwise operate with adequate protection in terms of I/N ratio being affected by the satellites. This probability can be determined both for the whole year and for the worst month.

This document uses the results of clear air interference analyses reported in the WP 4-9S Chairman's report (Doc. 4-9S/301 July 2002), Attachment 4 "Use of downlink fade compensation techniques by GSO FSS networks in the bands 37.5-40 and 40.5-42.5 GHz".

2. Methodology

The WP 3M Methodology consists of first fitting the propagation data of the area of interest to a log normal model devised by Paraboni and Barbaliscia[34] and using the resulting equation to calculate the probability:

$$
\begin{aligned}
&\Pr\{a \le A_1 \le b, A_2 \le A_1 - c\} \\
&= \Pr(A_1 \ge a) - \Pr(A_1 \ge b) - \sum_{i=1}^{n} \left\{ \begin{aligned} &\Pr\left(A_1 \ge a + (i-1)\,\delta - \frac{\delta}{2}, A_2 \ge a + (i-1)\,\delta - c \right) \\ &- \Pr\left(A_1 \ge a + (i-1)\,\delta + \frac{\delta}{2}, A_2 \ge a + (i-1)\,\delta - c \right) \end{aligned} \right\} \text{........(1)}
\end{aligned}
$$

This is the joint probability that the attenuation on the satellite to ES path is between "a" dB and "b" dB and the attenuation on the satellite to FS path is at least "c" dB less.

FS stations operating (c –a) dB below the threshold value can thus be expected to exceed the threshold value with the calculated probability. Assuming a threshold value of I/N of –10 dB, the stations operating with an I/N of –10-(c - a) dB would then exceed an I/N of –10 dB with a probability of Pr given by the above equation. Figure 1 shows the situation, depicting the region within which FS stations can be expected to receive increased interference as a result of downlink power control. In this diagram, A1 and A2 are the attenuation on the wanted and interference path respectively.

1. The formula given in equation (1) yields the probability of being in a portion of A1-A2 space such as the one bounded by D-H-F-D or E-G-F-E;
2. The first region in item 1 is for a c-value of 4.5 dB, and the second for c > 5.5 dB;
3. The fraction of time that enhanced interference due to differential fading is depicted by the triangle EFG;
4. The amount of additional interference is given by the difference in dB between points D and E;

[34] A. Paraboni, F. Barbaliscia, "Multiple Site Attenuation Prediction Models Based On The Rainfall Structures (Meso- Or Synoptic-Scales) For Advanced TLC Or Broadcasting Systems," *XXVIIth General Assembly of the International Union of Radio Science*, Maastricht, Netherlands, 2002.

5. The percent of FS receivers that would have an I/N exceeding a particular value can be obtained from Figure 1 on page 90 of Document 4-9S/301 (3 July 2002);

6. The increase in the fraction of FS receivers that would have an I/N greater than –10 dB may be found from Figure cited in item 5 as the difference between the fractional number exceeding –10 and the fractional number exceeding –10-(c-a) dB. This would occur for the fraction of time given by item 3;

7. By calculating the fraction of time that c values of 6.5, 7.5, … are exceeded, one can determine the fraction of time that I/N would increase by 2, 3, … dB, and using the figure in item 6 one can determine the additional fraction of receivers that would have an I/N greater than –10 dB.

Two examples have been run using the data provided by WP 3M. In this example, propagation information is given relating to:

Frequency: 40 GHz
Latitude/Longitude: 39N and 77.3W
Elevation angle: 39.0 or 17.7 degrees

Note; the 3M propagation data pertained only to 39 degrees. As the differential fades depend also upon the elevation angle of the satellite to earth station path, additional statistics were derived for an elevation angle of 17.7 degrees, the assumed minimum elevation angle.

For this location, the propagation statistics are given in Table 1. The Paraboni-Barbaliscia algorithm also requires the probability of rain in the area, which is given by applying Recommendation P.837-3[35], given by WP 3M as 7.067%.

Table 1 also gives the calculated worst month statistics calculated using the method in ITU-R Recommendation P. 841-2 using the global formula:

$$p = 0.3\ p_w(\%)^{1.15}. \qquad \ldots\ldots\ldots(2)$$

It is noted that the formula is accurate only for $p_w<7.8$. It is used here to calculate the worst month probability of rain, which is about 15 % using that formula. In actuality it may be higher, especially in areas with high-density small rain-cell rains and would thus under-estimate the impact on a worst month basis. Therefore, this is used here for illustrative purposes of the impact of differential attenuation on a worst month versus annual basis.

3.2.2.2 Results

The results of the methodology for annual and worst month probabilities for the two elevation angle cases are given in Tables 2 to 5 and Figures 2 to 5. The results are given for various separations and the values of the differential fades whose probability of occurrence is desired. The range of distance provided is 10-260 km and differential fade values of 4.5 to 16.5 dB, or I/N degradation factors of 0 to 12 dB.

The special case of co-located FS and ES stations (i.e. d = 0) needs to be mentioned. In this case both the interfering and wanted paths are identical. Hence for the case of zero differential, the probability is just the probability of the rain fades lying between “a” and “b” dB. For co-located stations, non-zero differential fades cannot occur and hence their probability is zero. For this reason, Tables 2 to 5 do not include this *singularity* and only starts with 10 km. However, in the case of small separations, small differential values are possible. It is clear that the integration step size in the methodology has a bearing.

Another special case category is the derivation of probability when the differential value sought is greater than the lower power control value, i.e. c > a dB. The WP 3M algorithm calls for determining the area bounded by the curves:

[35] ITU-R P.837-3: “ Characteristics of precipitation for propagation modelling (2001)”

$A_2 = A_1 - c$ and
$a < A1 < b$

In such a case, the minimum value of A_1 is c rather than a. Hence, in order to obtain the probability of differential values greater than "a" dB, only values of attenuation greater than that value of "c" have any significance. This effectively means that in applying equation 1, c replaces a and thus,

$$\Pr\{a \le A_1 \le b, A_2 \le A_1 - c\}$$
$$= \Pr(A_1 \ge c) - \Pr(A_1 \ge c) - \sum_{i=1}^{n} \left\{ \begin{array}{l} \Pr\left(A_1 \ge c + (i-1)\,\delta - \dfrac{\delta}{2}, A_2 \ge (i-1)\,\delta \right) \\ -\Pr\left(A_1 \ge c + (i-1)\,\delta + \dfrac{\delta}{2}, A_2 \ge (i-1)\,\delta \right) \end{array} \right\} \text{.............}(3)$$

Tables 2 to 5 were derived taking this into account. It is also assumed that though the values calculated represent the *probability* of the joint occurrences when evaluated annually or over the worst month, they also represent the *percentage of time* and of the worst month as well.

Figure 1 of the Chairman's report[36] shows that 1.25% of the FS stations within 50 km of an earth station have an I/N of –10 dB, and the percentage progressively decreases to 0.6, 0.5, 0.4 % when located at 100,150, 200 km from an earth station. From Tables 2 and 4, these stations would receive unacceptable interference for 0.9 or 1.4 %, 1.7 or 2.7% and 1.7 or 2.7% of the year, and, from Tables 8 and 10, for 2 or 2.7%, 3.8 or 5.4 % and 3.9 or 5.5% of the worst month, depending on the elevation angle of the satellite.

Similarly, stations with lower I/N's would be affected with probabilities determined by the differential attenuation on the two paths. For example, per Figure 1 of the Chairman's report, 2% of the terminals within 50 km receive interference greater than I/N = -12 dB. Depending on the elevation angle of 40 or 17.7 degrees, the additional 0.75% of the cases will experience or unacceptable interference 0.5 or 0.8 % of the year and 1 or 1.7 % of the worst month. From Figure 1 (of the Chairman's report), 7 % of the closely separated terminals receive and I/N of –20 dB or more. These additional 5.8% of the cases would receive unacceptable interference for .15 or .30 % of the year and 0.35 or 0.6 % of the worst month. It is also important to note that stations further away receive unacceptable interference due to differential fades for greater percentages of time than those close by.

3. Conclusion

Due to fading on the satellite to Earth station path the satellite may increase its emission levels resulting in increased interference in satellite to FS paths. This is offset by possible correlation in the fading between the two paths, which is dependent upon many factors, including separation between the two paths and the rain rates at the respective earth stations. The differential fade levels are themselves statistical in nature and can be evaluated with appropriate modeling of the rain fade distribution.

This document has calculated the probability of various differential fade levels occurring in a particular rain rate area, using a model based upon a liaison statement from WP 3M. The annual and worst month probabilities for various differential fade levels at various separations between the Earth and Fixed stations are obtained. These are the probabilities with which FS systems operating with adequate I/N ratios could receive unacceptable interference. The worst month rain model used is a global model, which may under-estimate the worst month impact in particular areas. It is desirable to continue work on obtaining worst month rain attenuation statistics which might be applied to particularly affected areas with small high velocity rain cells to assess the impact of differential fades in those areas. Descriptions of such areas have been described in WP 4-9S and forwarded to WP 3M.

[36] Working Party 4-9S Chairman's Report April 2002 Attachment 4, Annex 3: "An analysis of the impact to HDFS receivers during times in which fixed-satellite service providing services to gateway earth station nominal clear-sky power flux-density levels may be exceeded to overcome fading conditions in the bands 37.5-40 GHz and 40.5-42.5 GHz"

On the basis of the assumptions in this study, it is shown that the differential fades could result in unacceptable interference to an increasing percent of terminals for significant percentages of time when compared to the performance objectives. For a more complete assessment, it would be desirable to include worst month data for specific areas rather than the global formula used here. Additionally, studies with satellite examples with lower elevation angles than the 39 degrees assumed for the propagation data would be desirable.

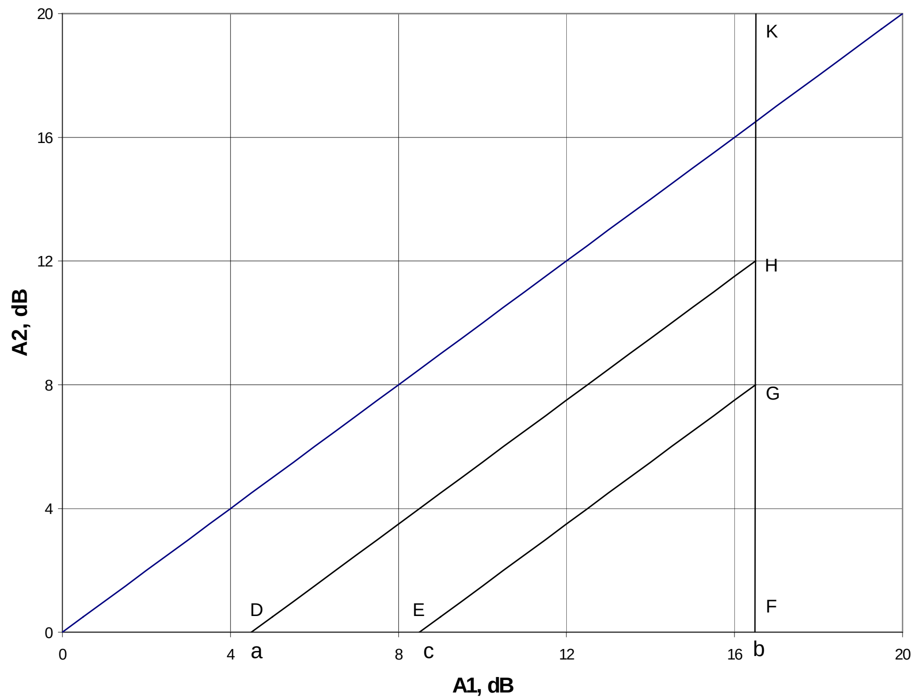
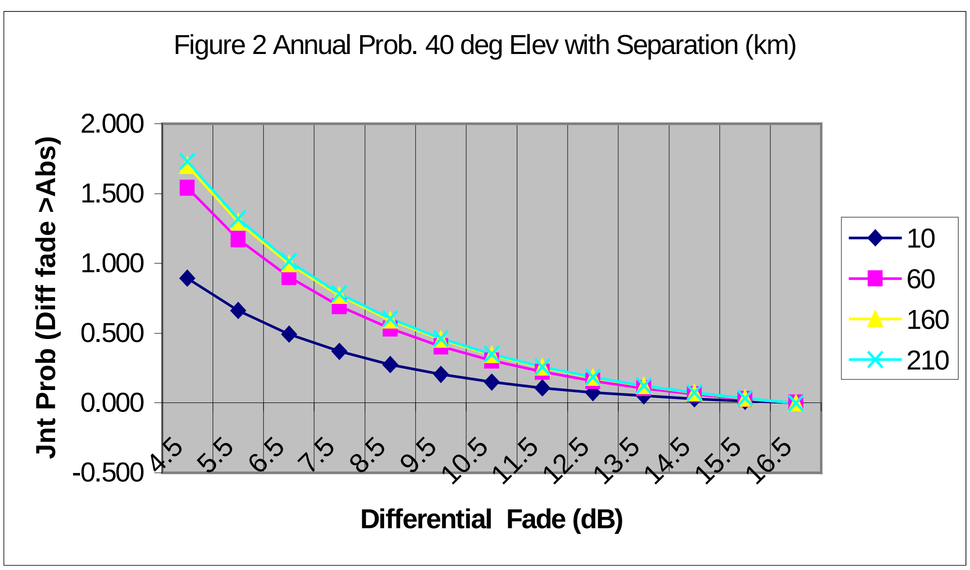


Figure 1 Wanted and Interference Path Attenuation Space



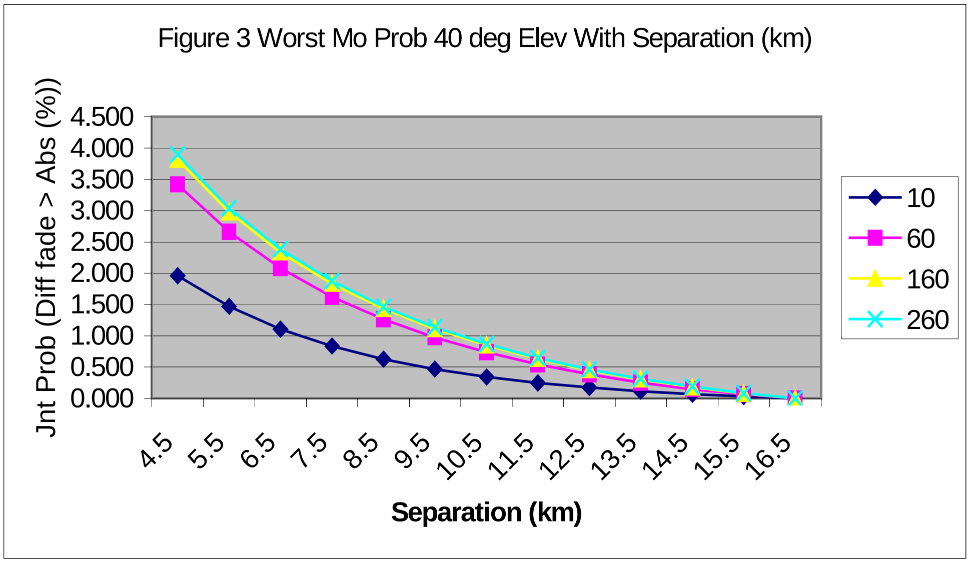


Figure 3 Worst Mo Prob 40 deg Elev With Separation (km)
Jnt Prob (Diff fade > Abs (%))
4.500
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
4.5
5.5
6.5
7.5
8.5
9.5
10.5
11.5
12.5
13.5
14.5
15.5
16.5
Separation (km)
10
60
160
260

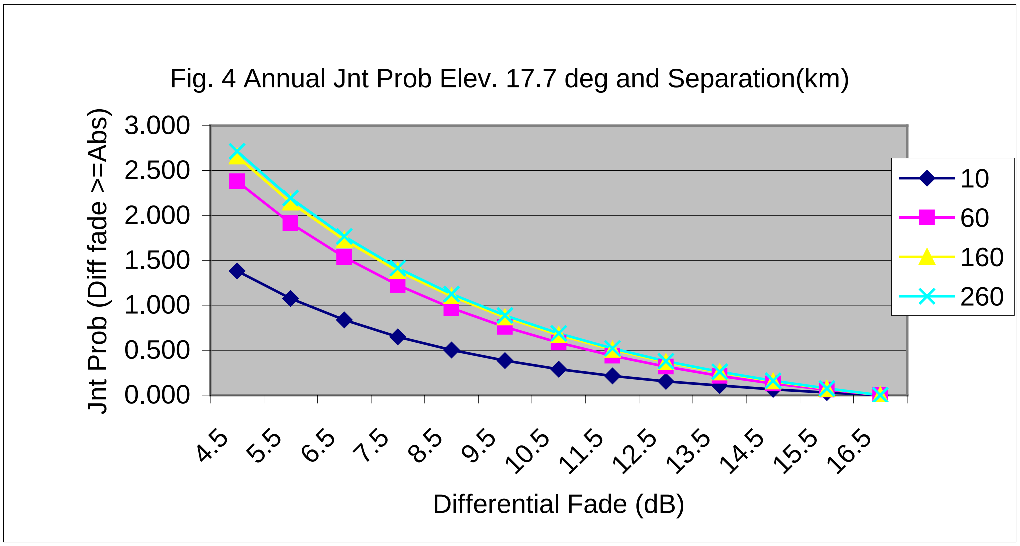


Fig. 4 Annual Jnt Prob Elev. 17.7 deg and Separation(km)
Jnt Prob (Diff fade >=Abs)
3.000
2.500
2.000
1.500
1.000
0.500
0.000
4.5
5.5
6.5
7.5
8.5
9.5
10.5
11.5
12.5
13.5
14.5
15.5
16.5
Differential Fade (dB)
10
60
160
260

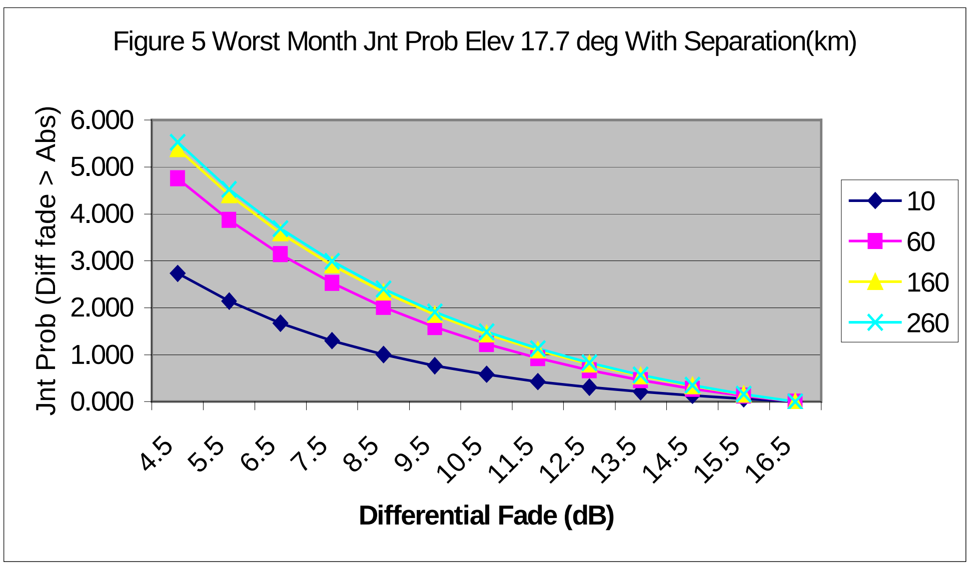


Figure 5 Worst Month Jnt Prob Elev 17.7 deg With Separation(km)
Jnt Prob (Diff fade > Abs)
6.000
5.000
4.000
3.000
2.000
1.000
0.000
4.5
5.5
6.5
7.5
8.5
9.5
10.5
11.5
12.5
13.5
14.5
15.5
16.5
Differential Fade (dB)
10
60
160
260

Table 1 Propagation Statistics

Elev 39 deg			Elev 17.7 deg		
Ann p%	**Att(dB)**	**Att(dB)**	**wm p%**	**Att(dB)**	**Att(dB)**
0.1	26.13	37.91	0.384691	26.13	37.91
0.09	27.44	39.74	0.351013	27.44	39.74
0.08	28.96	41.86	0.316842	28.96	41.86
0.07	30.74	44.36	0.282107	30.74	44.36
0.06	32.9	51.05	0.246718	32.9	51.05
0.05	35.57	55.81	0.210546	35.57	55.81
0.04	39.01	62.30	0.173411	39.01	62.30
0.03	43.74	72.08	0.135031	43.74	72.08
0.02	50.92	80.19	0.09491	50.92	80.19
0.01	64.38	93.05	0.051945	64.38	93.05
0.009	66.53	96.28	0.047398	66.53	96.28
0.008	68.97	96.28	0.042784	68.97	96.28
0.007	71.75	99.97	0.038093	71.75	99.97
0.006	75	104.24	0.033315	75	104.24
0.005	78.87	109.32	0.02843	78.87	109.32
0.004	83.62	115.52	0.023416	83.62	115.52
0.003	89.75	123.44	0.018233	89.75	123.44
0.002	98.23	134.28	0.012816	98.23	134.28
0.001	111.79	151.22	0.007014	111.79	151.22
7.067	0.00001	7.07	15.60064	0.00001	7.07

Table 2 Annual Probability (%) of Differential Attenuation vs Separation

Power Control Minimum = 4.5 dB Power Control Maximum = 16.5 dB Stepsize = 0.1

	Differential Attenuation Exceeded (dB)												
Sep'n (km)	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5
10	0.895	0.662	0.493	0.368	0.275	0.204	0.149	0.107	0.075	0.050	0.030	0.014	0.000
60	1.542	1.174	0.900	0.693	0.532	0.405	0.304	0.223	0.158	0.105	0.062	0.027	0.000
110	1.658	1.265	0.972	0.749	0.577	0.441	0.333	0.246	0.175	0.117	0.069	0.031	0.000
160	1.699	1.296	0.996	0.769	0.592	0.454	0.343	0.253	0.181	0.121	0.072	0.032	0.000
210	1.719	1.311	1.008	0.778	0.600	0.459	0.347	0.257	0.183	0.123	0.074	0.033	0.000
260	1.731	1.320	1.015	0.783	0.604	0.463	0.350	0.259	0.185	0.124	0.075	0.034	0.000
I/N Incr(dB)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0

Table 3 Probability (%) of Differential Attenuation vs Separation

Power Control Minimum = 4.5 dB Power Control Maximum = 16.5 dB Stepsize = 0.1

	Worst Month Differential Attenuation Elevation angle 40 degrees												
Sep'n (km)	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5
10	1.958	1.470	1.108	0.836	0.627	0.467	0.343	0.246	0.172	0.114	0.069	0.032	0.000
60	3.418	2.660	2.079	1.625	1.264	0.973	0.737	0.544	0.385	0.255	0.150	0.066	0.000
110	3.706	2.891	2.266	1.777	1.388	1.074	0.818	0.607	0.434	0.290	0.172	0.077	0.000
160	3.812	2.975	2.333	1.831	1.432	1.110	0.847	0.630	0.452	0.303	0.181	0.081	0.000
210	3.864	3.016	2.366	1.858	1.453	1.127	0.861	0.641	0.460	0.310	0.185	0.083	0.000
260	3.897	3.042	2.387	1.874	1.466	1.138	0.869	0.648	0.466	0.314	0.188	0.084	0.000

Table 4 Annual Probability (%) of Differential Attenuation vs Separation
Power Control Minimum = 4.5 dB Power Control Maximum = 16.5 dB Stepsize = 0.1
Annual Differential Attenuation (dB) Elevation Angle 17.7 Degrees

Sep'n (km)	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5
10	1.382	1.076	0.837	0.649	0.501	0.383	0.290	0.215	0.155	0.106	0.065	0.030	0.000
60	2.379	1.914	1.535	1.224	0.969	0.758	0.583	0.438	0.316	0.215	0.130	0.060	0.000
110	2.582	2.083	1.675	1.341	1.065	0.837	0.647	0.487	0.354	0.241	0.147	0.068	0.000
160	2.658	2.145	1.726	1.383	1.100	0.865	0.670	0.506	0.368	0.252	0.153	0.071	0.000
210	2.694	2.175	1.751	1.403	1.117	0.879	0.681	0.515	0.375	0.256	0.157	0.072	0.000
260	2.716	2.193	1.766	1.416	1.127	0.888	0.688	0.520	0.379	0.259	0.159	0.073	0.000

Table 5 Worst Mo Probability (%) of Differential Attenuation vs Separation
Power Control Minimum = 4.5 dB Power Control Maximum = 16.5 dB Stepsize = 0.1
Worst Month Differential Attenuation Elevation 17.7 Degrees

Sep'n (km)	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5
10	2.735	2.140	1.671	1.300	1.004	0.769	0.581	0.431	0.311	0.213	0.131	0.061	0.000
60	4.756	3.873	3.141	2.530	2.019	1.591	1.230	0.926	0.670	0.455	0.276	0.126	0.000
110	5.209	4.258	3.465	2.803	2.248	1.779	1.383	1.047	0.762	0.521	0.317	0.146	0.000
160	5.387	4.407	3.591	2.908	2.335	1.852	1.442	1.095	0.799	0.547	0.334	0.154	0.000
210	5.475	4.481	3.653	2.960	2.379	1.888	1.472	1.118	0.817	0.561	0.343	0.158	0.000
260	5.531	4.528	3.692	2.993	2.406	1.910	1.490	1.133	0.828	0.569	0.348	0.161	0.000

ATTACHMENT E

Separation Requirements To Protect FSS Earth Stations
From FS Stations At 39 GHz

1. Introduction

This document assesses the separation requirements between an FS station located in an urban environment and nearby FSS Earth stations at 39 GHz to allow both types of stations to co-exist with minimal coordination requirements. It is assumed that the earth station azimuth is directly in line with the FS station and has a minimum elevation angle of 15 degrees. As the FS station may be pointed in any direction, it is also assumed that the FS station transmission direction is towards the earth station.

2. FS Parameters

In the 39 GHz band fixed stations are designed to provide normally single hop point to point connectivity either between a central building and other buildings scattered within a range of about 2-4 km. A given community may have several such central buildings. Although predominantly located in urban and suburban areas, the stations may be located in rural areas. . In addition to the above, transportable stations may be used as relays connecting stations on buildings at 39 GHz and retransmitting the signals via satellite or other means. These transportable stations may also be located in both urban and rural areas, and are particularly attractive in the latter case.

FS transmitters are capable of providing several channel capacities ranging from 4 T1 to OC3 and can be transmitted in the available 50 MHz channel bandwidths with an appropriate order of modulation (QPSK, 16 QAM, 128 QAM etc). Table 1 contains the transmission parameters of transmitters from several manufacturers for services most often provided.

Table 1 FS Equipment Parameters

No.	Manufacturer	Radio Name	Capacity	States	Bandwidth	Rx Thresh	TxPwr
					(MHz)	dBm	dBm
1.	Harris	SPR 5000	8 DS1	4	10	-87	22.5
2.				16	5	-82.5	19.5
3			16 DS1	4	20	-85.5	22.5
4				16	10	-81.5	19.5
5			28 DS1	16	15	-77.5	19.5
6				32	12.5	-75.5	18.5
7				64	10	-73	17.5
8			OC3	32	50	-74.5	18.5
9				128	30	-67.5	14.5
10		Galaxy	OC3		50	-73.5	16.5
11		Microstar M	8 DS1	4	10	-84.5	13
12			16 DS1	4	20	-81.5	13
13			DS 3	4	40	-79	13
14			DS3	16Q	30	-74.5	10
15	P-COM	TEL-Link Encore	8 T1	4	10	-77	17
16			16 T1	4	20	-74	17
17			DS 3	4	40	-71	17
18			OC3	16Q	50	-70	16
19				128Q	28	-65	14.5

20	Ceragon	Fibre1500	OC3	16Q	50	-70	15

These transmitters are deployed in links which range from a few meters to 4 km or more using antennas of 1 ft to 4 ft in diameter. The links are designed to provide 99.999% availability at a BER of 10^{-6}, within the limitations of the power limits indicated in Table 1. At 39 GHz rain attenuation is a significant factor and as indicated in Table 2, the maximum power allowed by the equipment is often required. In Table 2, it is assumed that the transmit and receive antennas are the one foot antennas (30 cm). The power requirement for 1.5 km hops are shown in the Table. The rain fade is calculated using the Crane model in Rain zone D2. Atmospheric loss is calculated using ITU-R P.676 with water vapor density 3.5 $mg/m^{3,}$ 1013 Hg Pressure and 15 deg C temperature.

Table 2 Power Density for 1.5 km Links for Carriers in Table 1

No.	FS Atten	Rain Fade	Min Sig Level	Atm Loss	Rx Sig Level	Nec. Pwr	Final Pwr	Pwr/MHz
		DB	dBm					
1	124.27	38.00	-49.00	0.23	-25.52	-0.98	-0.98	-10.98
2	130.29	38.00	-44.50	0.23	-28.52	3.52	3.52	-3.47
3	133.81	38.00	-47.50	0.23	-25.52	0.52	0.52	-12.49
4	136.31	38.00	-43.50	0.23	-28.52	4.52	4.52	-5.48
5	138.25	38.00	-39.50	0.23	-28.52	8.52	8.52	-3.24
6	139.83	38.00	-37.50	0.23	-29.52	10.52	10.52	-0.45
7	141.17	38.00	-35.00	0.23	-30.52	13.02	13.02	3.02
8	142.33	38.00	-36.50	0.23	-29.52	11.52	11.52	-5.47
9	143.36	38.00	-29.50	0.23	-33.52	18.52	14.50	-0.27
10	144.27	38.00	-35.50	0.23	-31.52	12.52	12.52	-4.47
11	145.10	38.00	-46.50	0.23	-35.02	1.52	1.52	-8.48
12	145.85	38.00	-43.50	0.23	-35.02	4.52	4.52	-8.49
13	146.55	38.00	-41.00	0.23	-35.02	7.02	7.02	-9.00
14	147.19	38.00	-36.50	0.23	-38.02	11.52	10.00	-4.77
15	147.79	38.00	-39.00	0.23	-31.02	9.02	9.02	-0.98
16	148.35	38.00	-36.00	0.23	-31.02	12.02	12.02	-0.99
17	148.88	38.00	-33.00	0.23	-31.02	15.02	15.02	2.00
18	149.38	38.00	-32.00	0.23	-32.02	16.02	16.00	2.01
19	149.85	38.00	-27.00	0.23	-33.52	21.02	14.50	3.03
20	150.29	38.00	-32.00	0.23	-33.02	16.02	15.00	1.01

In the above Table, the "Final Power" is the actual power which is the lower of the actual power required and the maximum transmitter power as given in Table 1.

3. Earth Station Parameters

Earth station parameters are taken from the NGST V band submission. It indicates a minimum operation elevation angle of 15 degrees. The allowable interference is based on a potential of 2 equal level entries, although more are likely in practice, given the large number of FS links in nearby communities. Table 3 summarizes the key interference parameters for calculation purposes.

Table 3 FSS Earth Station Parameters

Parameter	Value	Units	Source
Antenna Diameter (D)	2.7	m	NGST
Min Elevation Angle	15	degrees	NGST
Maximum Antenna Gain	53	dBi	NGST
Antenna Gain Pattern	29-25 log φ	dBi	RR Ap 7
Receiving Syst. Noise Temp(T_{sys})	346.6	Kelvins	NGST
Receiver Noise Power Density (N_{sys})	-143.2	dBW/MHz	$kT_{sys} \cdot 10^6$
Acceptable interference power density	-156.2	dBW/MHz	N_{sys}-13

4. Separation Requirements

Separation requirements are determined taking into account the free space loss as well as the atmospheric attenuation. The latter depends upon the water vapor density. A typical value of 3.5 g/m^3 would lead to a loss rate of 0.15 dB/km. Because the power density for the various capacities is different, it is necessary to ensure that the distance is sufficient to protect the earth station from the worst power density. Table 4 gives the minimum separations required to meet a criterion of –156.2 dBW/MHz. A minimum separation of 60 km is indicated so as to allow maximum flexibility for FS deployment and at the same time to avoid interfering into the FSS Earth station. In the case of the transportable stations which would typically be close to the ground the separation requirements would be governed by the horizon distance. However, it should be taken into account that these transportable stations are likely to be located for periods of time in suburban and rural areas. Hence the distance requirements are determined by the locus of the transportable activity. In order to avoid coordination difficulties it is recommended that gateway earth stations be located at least 60 km from the high density fixed station communities.

5. Conclusion

Based upon the lone V-band system currently filed with the FCC, the gateway earth stations need to be located at significant distances from areas with a large concentration of FS systems providing high quality links. Some typical assumptions have been used and, for an average moist climate (3.5 mg/mm^3), separation of the order of 60 km beyond the major communities with high density fixed usage is recommended. This distance would be smaller in more moist climates and larger in dryer climates.

Table 4 Separation Requirements

No.	Final Pwr	Pwr/MHz	ES AntGn	ES Int critkTB	FSLoss	Min Dist
			at 15deg	dBm/MHz		km
1	-0.98	-10.98	-0.40	-126.20	159.08	23
2	3.52	-3.47	-0.40	-126.20	159.08	41
3	0.52	-12.49	-0.40	-126.20	159.08	21
4	4.52	-5.48	-0.40	-126.20	159.08	35
5	8.52	-3.24	-0.40	-126.20	159.08	41
6	10.52	-0.45	-0.40	-126.20	159.08	49
7	13.02	3.02	-0.40	-126.20	159.08	60
8	11.52	-5.47	-0.40	-126.20	159.08	35
9	14.50	-0.27	-0.40	-126.20	159.08	50
10	12.52	-4.47	-0.40	-126.20	159.08	38
11	1.52	-8.48	-0.40	-126.20	159.08	28
12	4.52	-8.49	-0.40	-126.20	159.08	28
13	7.02	-9.00	-0.40	-126.20	159.08	27
14	10.00	-4.77	-0.40	-126.20	159.08	37
15	9.02	-0.98	-0.40	-126.20	159.08	48
16	12.02	-0.99	-0.40	-126.20	159.08	48
17	15.02	-1.00	-0.40	-126.20	159.08	48
18	16.00	-0.99	-0.40	-126.20	159.08	48
19	14.50	3.03	-0.40	-126.20	159.08	51
S20	15.00	1.01	-0.40	-126.20	159.08	45